PROFESSIONAL ENGINEER

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FALL ISSUE

Principles of Professional Conduct in Engineering

The Profession's First Code of Ethics

The Engineer's Vow of Service

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Vol. 41 No. 2

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Ethics

M. E. McIver, Editor

EVER since its inception, American Association of Engineers h been interested in an Ethical Code for Engineers. In fact, undi the able leadership of Isham Randolph, the Association brought out code (printed elsewhere in this issue) in 1918 which has been said such eminent men as the late Dr. J. A. L. Waddell, and Morris L. Co to be the best code thus far formulated. Probably one of the m specific articles on ethics was prepared by the Association and publish in The Annals of the American Academy of Political and Social Scie in 1922. At the request of the Editor of The Annals, the Associatio committee on Professional Ethics, H. A. Wagner, Chairman, prepar a review on Engineering Ethics, since 1922, and this article was pu lished in the January 1955, issue of The Annals. In order that t material may be a part of the record of the Association, and furthermo that our members may have a working knowledge of what has been do we are reprinting the article in this issue.

Actually, a code of ethics is only an elaborated statement of t general principles of ethics which are synonymous with "professiona ism." And while we believe that a strict code of ethics is helpful, we believe that it is in the field of enforcement that engineering experienc its greatest handicap.

In 1931, C. J. Ullrich, an attorney, an authority on engineering regi tration and a past president of the Association, had this to say editoria on the enforcement of a code of ethics. "Under present conditions with the profession, there is no method by which a code of ethics no matt how admirable such a code might be, can be enforced. To be able enforce anything, presupposes some force or power back of it. Wh machinery has the profession today to enforce a code of ethics? No Almost every engineering organization has adopted some sort of ethical code for the conduct of its members, but what is there back such codes to enforce them? Nothing but expulsion from the organiz tion, and that does not correct the evil. The expelled member could a probably would for vindicative reasons, be more unethical in his pr fessional practice after expulsion than before.

"In our opinion, no universal code of ethics for the engineering ession will ever be effective until the profession has the force of law back of it. We further believe that the only way in which profession will ever get the force of a law back of a code of ethics is igh the registration of engineers."

Today we have registration laws in all of our states, but how far the profession progressed in the enforcement of its many codes of s?

We invite engineers to send us their opinions on this much abused, n talked about and much debated subject not only among engineer- groups, but all professions and businesses as well. "To my humble of thinking," says Chairman Wagner, "ethics is simply the Golden put into practice and to intelligent professional men and women, should be sufficient."

But let's have your opinion!

YOUR OPINIONS ARE ALWAYS WELCOME

We invite our members to let us have their ideas, their suggestions, their constructive criticisms . . . that's the way we can build a better and more useful Society for Engineers.

The Engineer and His Ethics

Edmund J. Fitzmaurice, Director, A.A.E.

'EBSTER defines ethics as "the moral duty of man" and the writer wonders just how the Engineer of today tries to fulfill that duty? Before giving an opinion it is customary for the witness to be qualified termine his credibility and knowledge of the subject under discussion, us see if the writer can qualify.

He was "born and raised" in Philadelphia, Pa., attending the public ls, the old Central Manual Training School and graduating in Engi- ng from the University of Pennsylvania about fifty years ago. He ed after school and during the summer from the grammar grades up d including his University career. This taught him not only to appre- the value of a dollar earned, but to meet and study various workers, laborer to skilled mechanic and business men of many sorts and types. After graduation, he continued in the Engineering Profession, and he never did, and probably never will amass any great wealth, it

taught him, like Abbu Ben Adhem, to love his fellow man, and he is able to sleep at night without the use of sedatives.

If, after reading the above, you are not interested then just toss article into the waste basket and keep on complaining about the we and the general unrest in the world today. On the other hand, if you be just slightly interested, then bear with the writer and determine wh his statements be fact or fiction.

Engineers as a group are probably the most ungrateful individua the world. We may set into motion the various trends that give the y Engineer a better starting wage and the means for him to progress ra to worthwhile positions in the Engineering world, and he will forg about the individuals and associations that made his success possible make his own personal selfishness the shining beacon to guide his care

However, there are two notable exceptions to this rule, and writer refers to the young Engineer who has worked during his sum vacations at various jobs connected with industry or construction o one who graduates from one of our cooperative schools working six m in industry for each year of his college training. When we are fort enough to land one of these individuals, we find him a gem in the roug we are fortunate if we can hold onto him.

However, the majority of the young Engineers do not fall int class but received a college education as a gift of indulgent parents o grateful government and think they are a choice gift to mankind. This has set ideas on the value of its services, though the young graduate not have the slightest practical experience in science, engineering or struction, and will cost the individual, firm, or corporation hiring him a siderable sum before he is of any real value to his employer.

He has not been taught, or if taught has probably conveniently gotten, all questions of Loyalty or Esprit de Corps. He thinks only o own personal interests and will ride roughshod over any and all o associates in his frantic endeavor to get to the top. As soon as he has pleted two years of basic training, he is no longer interested in engine but wants to be an "executive," "manager," or "director."

When he has oversold himself, he finds it difficult to manage or with absolutely no experience along those lines. His superiors, appoi him to such a position, are unfair to him regardless of his "connecti because even a mother bird will not push the young birds out of the until their wings are capable of flight. Since the young Engineer re instructions in only the fundamentals of Engineering while at school, supposed to learn the application of those fundamentals in the dra room. If he does not have this practical training, he will regret it lat in life when he has to make a decision and does not have the backg experience to warrant a sensible decision.

Whoever put desks in drafting rooms, made a very poor error of ment, because as soon as young Engineer gets a desk, he thinks it is

ignity to make a drawing and proceeds to make small freehand sketches someone else to embody in a finished drawing. Since he had only a limited experience on the board, he either is unable to express his in his sketches or else ends with some absurd "Goldberg" that is actical. He has never learned to indicate on a drawing only the neces- details for quick reading and interpretation in the field and for ease nstruction. Eventually he may realize that a few extra hours on the l are far cheaper than tying up a field crew of many men waiting heir foreman to decipher just what is meant by a drawing with many d but useless sets of dimensions.

The writer does not mean to imply that the young Engineer cannot make d "executive"—some in less time than others. He knows that a large ntage can and will succeed; some in a shorter time than others, hey should not expect to be placed in such positions until they are fied by serving an apprenticeship alongside of the present incumbent id position. Instead, they imagine the appointment gives them some e right to rule and expect the older experienced engineers to do the while they bask in the sunshine and glory made possible by the ledge and experience of others.

Ethics in the Profession— By Whom, For Whom?

E. C. Shuman, Director, A.A.E.

UCH has been written and said about ethics within the profession of engineering, and no doubt much has been done to instil it in the minds ofessional men for use. The engineering profession, apart from the , has one of the greatest opportunities to observe ethical standards professional activities. Yet every once in a while, something jolts who have been feeling that something is really being accomplished. t is supposed that ethical progress depends upon the strong aiding eak; that constitutes at least a part of ethical upgrading. In a short nent, space will not permit backgrounds and cause and effect discussion n have already been covered by others more adequately than is possible is writer.

But if ethics in the profession includes consideration of adequate com- tion for responsibilities carried, give thought to the following adver- ent in two Founder Society publications.

'BS, age 30-50, with minimum 5 to 10 years experience in design or development, with aptitude for basic product development. Knowl- of design and development principles and evaluation. Duties: respon- determination of limitations, comparisons, fulfilments of design rements through media of calculations, drawings, reports, experi-

mentation and test, selection and specification of materials for the proc as established by production. Salary $5,700-$7,200 a year. Employer negotiate the placement fee."

In one of the Founder's publications this was followed by ano listing for a junior engineer requiring 2 or more years experience salary $5,700-$6,600 a year plus moving expenses. Also, the employer pay placement fee.

In the former case, an exceptionally high caliber man is wanted responsibilities admitted to be above the average, yet the starting sa offered is equivalent to that of a junior engineer. Average starting sala for graduates are close to these.

While there were no indecent words used in the printing, the societies far amiss when they condone such advertising in their own publicati Ethics implies a moral code observance, and not a policy of caveat emp nor the weak excuse that no one need apply if not interested.

If engineering societies do not police their advertising to keep it so where near the principles they publish in articles on ethics by t "authorities," then there is no need for the consultants, directors, managers to wail when younger engineers join you know what!

It is hoped such advertising is stopped as being unacceptable b engineering societies themselves, while there is still time to practice e and while there is still an engineering profession.

Ethical Reporting of Engineering Findings and Determinations

By Colonel Walter R. Jeffrey

IN canons of ethics the fiduciary relationship existing between m bers of learned professions and their clients is clearly recogni Registration laws, in special provisions, define special aspects of relationship. Each profession, in its own canons of ethics and code "professional conduct" makes specific the obligations of its mem to their clients. There are still areas in which ethical considerations not clearly defined. Colonel Walter R. Jeffrey has set down cer precepts for technical statisticians which are intended to insure perfo ance that measures up to the highest standards imposed by the fiduc relationship which exists between statisticians and their clients.

1. Approach the survey, audit, inspection, investigation, or st preliminary to findings and determinations, with an open mind. the truth! Get the facts! Obtain all the data pertaining to your ject and within the scope of study. Observe study and analyze

itions and circumstances surrounding these data and co-ordinate related information. Objectivity and depth are requisite.

2. Select those data that are pertinent to the problem and disregard e that do not contribute to the end result. Above all, exercise rity, wisdom, and judgment in the identification, selection, and rding in workpapers of important data.

3. Study the appropriate authorizations and statutes or regulations great understanding. Consult with legal advisors for official inter- tions. Consult with owners, management, and operators for practice realistic applications. It is important to ascertain what authorities, edures, and circumstances are necessary to activities under statutes gulations. The intent back of statutes is considered in interpreta- and their proper utilization precludes erroneous application of ations due to inexperience and literal mindedness.

4. Staff all gathered data with responsible persons and research ta to their source for maximum comprehension of their substances significance.

5. Analyze and/or synthesize these facts in relation to criteria ble for comparisons, measurements, or induced or deduced con- ns.

6. Appraise and evaluate these facts in relation to the mission bjective of the subject study.

7. Draft the findings and determinations:

a. There must be materiality, substance, and significance appropriate to the level of the addressee of the report.

b. The opening sentence and/or paragraph should be forceful, giving the effect of the facts on the organization or affected item and the factual reasons or causes.

c. Develop the findings, as briefly as appropriate, and factually portray actions or data in a clear and concise manner. Detail results and causes. Use convincing language suited to the intended readers. Convey the ideas with honesty and conviction.

d. Above all, in the presentation of facts and conclusions, it is imperative to preserve the intergrity and truth of all the facts and to utilize mature and sound judgment in all conclusions.

8. Weigh the findings and make certain that their presentation eptable and will accomplish the mission and objective set out for plishment.

9. Prepare the determinations or recommendations:

a. They must be constructive and practicable.

b. They must induce favorable action.

c. They must produce a profit or a satisfaction.

d. They must indicate completed staff work.

Dr. Steinman Wins Poetry Prize

THE WISCONSIN POETRY FOUNDATION has announc award of first prize for poetry to David B. Steinman, internat eminent bridge engineer. Dr. Steinman's award came for his r published book, "I Built a Bridge, and Other Poems." His poetic wo selected for the honor because of its spiritual content and deeply re note, also for its inspired treatment of the poetry of bridges.

Mrs. Clara Catherine Price, founder of the American Poetry zine, editor of the Wisconsin Poetry Magazine, and founder of the consin Poetry Foundation, said, "Dr. Steinman's work was chosen b of his religious approach and because of the subject which is very

Dr. Steinman, who is a newcomer in the art of poetry, has a received recognition in this field. He is a life-member and trustee Poetry Society of Michigan, and life-member of the Wisconsin Foundation.

The engineer-poet is better known for his life work as a bridge b Dr. Steinman has built 370 notable bridges on five continents, a received eight awards for the most beautiful bridges in America. presently engaged on the construction of the world's largest bridge p the $100,000,000 Mackinac Bridge in Michigan.

Bits of Information

Did you know that—

. . . it takes 18,000 gallons of water to make a ton of ingot iron

. . . it takes 65,000 gallons of water to convert this ton of iron int

. . . the steel industry uses 4 trillion gallons of water a year.

. . . It takes 160 gallons of water to make a pound of aluminum or a of synthetic rubber, and

. . . 470 gallons to make a barrel of beer.

. . . For a pound of a steer's weight, he has required—for himself a grass he has eaten—3,750 gallons of water.

. . . The growth and manufacture of one slice of bread require gallons of water, and a helping of potatoes takes 1,405 gallons.

. . . In the household each one of us uses an average of 50 gall water a day.

. . . According to Robert H. Morse, Jr., we are using water at the 100 billion gallons a day for irrigation, 81 billion gallons for in and 19 billion for other uses, or a total of 200 billion gallons

. . . A Speech Typewriter that will type out spoken words in conve letters, has been prophesied by RCA Laboratories. Such a already has been constructed with a vocabulary of 10 common lish words. Machine types from dictation with 80 percent accu and that's about as good as any present-day secretary.

Principles of Professional Conduct In Engineering

This article was prepared by the A.A.E. Committee on Professional Conduct and Ethical Standards, H. A. Wagner, Chairman, at the request of the editors of The Annals, publication of the American Academy of Political and Social Science, and published in their Journal, January, 1955, together with a number of other interesting articles on the subject of Ethics by men prominent in their respective professions such as Public Accounting, Architecture, Medicine, and Law.

WHEN the American Academy of Political and Social Science, in The Annals of May 1922, pub- a symposium on ethical standards ness and the professions, it showed ngineering had made measurable ss in defining professionalism and izing its ethical obligations, and reducing these first broad concepts tively "specific" principles of pro- al conduct. The symposium also d that scant progress had been n the establishment of agencies to et, apply, and enforce these prin- Thirty-two years have elapsed, e situation is little changed. Then, , engineering was hampered by the f an inclusive organization, uni- y recognized as its authorized nan, empowered to pass judgment hical conduct and punish offenders American Medical Association and erican Bar Association and their ent state societies deal with un- practice in their respective fields.[1]

ONS OF ETHICS FOR ENGINEERS

ite this fact, engineers have reached in accord in regard to ethical es. Many of the national societies nbers of state and local organizations have officially adopted the Canons of Ethics formulated by the Engineers' Council for Professional Development, an agency created by the Founder Societies in 1932. In 1947, the Council synthesized the major principles found in the ethical codes formulated by many of the leading societies. Many of the original codes were in operation in 1922, and some of these were published in The Annals, notably those of the American Institute of Electrical Engineers (which seems to have been the leader of the movement, with a code drafted in 1910 and officially adopted in 1912), the American Society of Civil Engineers, the American Society of Mechanical Engineers, and the American Association of Engineers. Two of these might more properly have been called "creeds" rather than "codes," as they were modeled after the Hippocratic Oath. Others referred to specific practices then too prevalent which were regarded as hurtful to the profession. Through the years the societies extended the coverage of their codes and revised "principles of professional conduct" as changing conditions of practice and new problems required. Nearly all the provisions of these codes could be classified under the head-

neers are represented by more than a admirable national societies; preeminent em are the Founder Societies, each rep- one of the four major branches of engi- (civil, electrical, mechanical, mining and rical). Since 1917 they have collabo- certain types of activities through a se- agencies which they have created. some of these agencies, at intervals, ineering societies have been loosely affil- h the Founders. None of these agen- ver been recognized by the public as the t of the American Bar Association or the American Medical Association; consequently, none has ever been able to influence public opinion as do these two organizations, or use this force to discipline offenders against codes of ethics. Engineering's ethical codes, for example, require engineers to discourage the spreading of exaggerated statements regarding engineering, but the societies cannot deal summarily with offenders, as the American Medical Association chastises doctors who publicly endorse or seem to exploit new wonder drugs or therapy not fully tested or not approved by the profession.

ings found in the Canons of Ethics for Engineers adopted by the Engineers' Council for Professional Development, namely, obligations imposed by membership in a profession, and the engineer's relations with the public, with clients and employers, and with other engineers. A copy of the code is appended.

Not all the engineering societies have adopted the ECPD Canons of Ethics, but none of the adopted codes is at variance with the Canons. Some of the societies have found it advisable to retain codes drafted for and by their own members, because these codes deal in greater detail with problems which, if not peculiar to particular segments of the engineering profession, are at least more acute in these fields of practice. In certain branches of engineering, for instance, the ownership of engineering records and data may pose ethical problems of such complexity that a society may find it necessary to incorporate in its code of principles of professional conduct a section devoted to this aspect of ethics more detailed than is necessary in Canons of Ethics drafted for engineering societies in general. Other organizations, especially those composed of engineers engaged in a particular industry (automotive, refrigerating, illuminating, aeronautical engineering, and others) may adopt the Canons officially, or many consider that they have tacitly accepted these rules because most of their members belong to technical societies which have adopted the ECPD Canons of Ethics. Still other technical and industrial groups subscribe to the principles but believe that "moral responsibilities cannot be legislated" and rely upon constitutional provisions for dealing with members who "fail to be honest or live up to the code of any gentleman." It can be said that the societies are in accord with regard to fundamentals, but that there are practices denounced by the societies in their codes which are still defended by large numbers of engineers.

American Association of Engineers

In the invitation to prepare this discussion of ethics in the engineering profession, the author was instructed to detail the work of at least one national and one local group. He has chosen to trac movement in the American Associati Engineers, first of all because he is familiar with the procedure in that o ization. In the second place, three o distinguished engineers who contri to the 1922 symposium were membe this organization and the American ciation of Engineers was the a through which they worked to im ethical standards.[2] The third reaso choosing the AAE to exemplify the lution of ethical standards is that t its original aims, stated in the pream its constitution, are basic elements i fessional ethics. The AAE anno that it intended to "stimulate public ice in the profession" and "to pr unity in the profession." In the firs the AAE recognized the most disti characteristic of a profession—its tion to serve society. In the sec recognized an equally important c teristic, the principle that engineers stages of professional development the very nature of a profession obligation to deal fairly with each for the good of the profession a members. The fourth and most com reason for the author's choice AAE is the fact that the associ campaign was not fortuitous; it wa planned and carried forward in sta leaders who were fully aware of t portance of timing.

Engineering's first code

Morris Llewellyn Cooke, well for his work in later years in the Electrification Administration, wa tician of the movement. It was 1918, who called for a "true-blue a spiring code of ethics for engineers specified that it should be the work man, not of a committee, because mittee work is accomplished to a g or less degree by compromise and

[2] These three engineers were: Morri ellyn Cooke, tactician of the AAE campa higher ethical standards; Frederick Hayn ell (known as Father of the Reclamatio ice), President of AAE in 1919-20; H. W sen, in whose memory the Clausen M awarded for "distinguished service for t fare of engineers."

ot want compromise in ethics." At the ame time he said:

ntil we engineers can place the service humanity as the significant and dom- ant plank in our platform, the profession ill continue to have the status of the ired servant, and veer here and there as ie winds of business and other special terests may dictate. . . .

is suggestion was adopted, and Isham andolph wrote the code which appeared the 1922 ANNALS, reprinted in the Ap- ndix of the present article.

ractice Committee codification

At Mr. Cooke's suggestion the Associa- on created a Practice Committee to hich were referred real and hypotheti- l questions concerning the ethics of ecific practices. These questions were nsidered by the Practice Committee, d some of them were assigned to state d local chapters of the Association for udy and discussion. The decisions of e Practice Committee and reports from e chapters were published in the Asso- iation's journal. By every possible means e Association stimulated the interest of members in questions of ethics. This is in line with the plan made by Mr. ooke who, in 1920, in an article in *Pro- ssional Engineer* (the Association's of- ial publication) said:

hical conduct is such as has received re or less general sanction. This means t conduct which at one time or place y receive very generous approval at other time or in a different locality y be generally considered reprehensible. . Higher standards only become the es for conduct when through education y have become accepted as proper by sufficiently large or influential element hin the constituency. . . .

Mr. Cooke recommended that:

Practice Committee should subdivide cases submitted to it into at least two sses: (a) Those upon which the best ttiment of the profession is now cap- e of concrete expression, and (b) those ch require special analysis and pro- ted study and discussion in order to elop what is our best thought.

t this time, too, Mr. Cooke warned against any "effort at rigorous discipline." He said that the educational work of the Practice Committee was its most valuable contribution, and that clarifying an engineer's relationship and responsibilities would count more at that time than trials for unprofessional conduct. The questions submitted to the Practice Committee involved many practices detrimental to engineers, to the profession, and to society, but they were accepted or common practices, and presumably in harmony with existing principles of ethics. By provoking discussion of these practices harmful to the profession, the American Association of Engineers led its members to acceptance of higher standards of ethics.

During this period C. F. Taeusch, associate professor of philosophy at Iowa State University, became the adviser of the Practice Committee. Dr. D. B. Steinman, eminent and internationally known bridge engineer of New York, directed the work of codifying Practice Committee decisions for publication in *Professional Engineer* in 1923 (with identifying names of persons or places deleted). In 1927 the Association issued a booklet entitled *The Engineer and His Ethics,* which contained this codification of Practice Committee decisions, the Isham Randolph Code of Ethics, and the Vow of Service, written by Dr. D. B. Steinman —all reprinted in full in the Appendix. This booklet was distributed to AAE chapters and to engineering schools. Thus the Association followed the advice of Mr. Cooke in clarifying for engineers and future engineers their relationships and responsibilities.

Booklet for the public

Realizing that the public had an important though unrecognized interest in the ethical standards of engineering and a direct influence upon those standards, the Association in 1929 brought out a booklet prepared by its Committee on Services and Fees of Practicing Engineers, entitled *How to Employ and Use the Services of Practicing Engineers.* This booklet struck directly at the unwise practice of engaging engineering services on the basis of competitive bids. In addi-

tion to information on legitimate methods of engaging the services of engineers, the booklet contained a typical form of agreement, a schedule of minimum recommended fees, and the Code of Practice of the American Society of Civil Engineers, adopted by that organization in 1927. The Association used the ASCE Code rather than its own 1924 codification of Practice Committee cases "in the interest of uniformity and to avoid duplication of effort."

Other National Societies

Since 1927 many of the national societies have developed and published manuals of practice much more comprehensive and detailed than the AAE's booklet on employment and use of the services of practicing engineers. Each society emphasizes problem areas which are of special concern to its members. Every national organization is using its resources to "clarify relationships and obligations" of engineers and to bring about acceptance of principles which prescribe practices beneficial to engineers, the profession, and the public.

Enforcement Practices

Unlike the professions of law and medicine engineering cannot enforce its codes by drastic means, for reasons which were stated in the beginning of this article. Each society must handle violations of its code by its own members. Although a Judiciary Committee was created in 1922 by the American Association of Engineers to serve as a court of appeal from decisions of the Practice Committee and given authority to suspend or expel members who violated the code, it has considered few cases. Other societies have similar agencies, but if they have resorted to rigorous discipline of violators of ethical codes, it has been done with such discretion and dignity that few members of the societies have been aware of the action.

Suspension or expulsion from membership in a major engineering society is a terrific rebuke, but it may have little effect on the individual's future practice of engineering, unless the action is widely publicized. The fear of suspension or expulsion may be a strong deterrent against unethical conduct among members wh have joined national organizations fo prestige and "contacts." For mercenar reasons they cherish the respect of to ranking consultants and of engineers em nent in private practice or in industry Such punishment as can be meted out b the societies is not a strong deterre against unethical conduct on the part o less sensitive or less ambitious men. Th man who is prone to unethical conduct likely to be callous. He may have a rela tively small but satisfactory field of pra tice in an area where the public general and most of the businessmen who are po tential users of his services know little the great national engineering organiza tions. The societies have no disciplina power over nonmembers.

Unethical engineers are protected some degree by the ethical obligation engineers to refrain from "harming" a other member of the profession. Engine who have seen signs of incompetency dishonesty are reluctant to initiate acti unless the evidence amounts to almost controvertible proof, or the element real and present public danger is so appa ent as to compel such action, that is, l a positive ethical obligation upon the e gineer who is aware of the situation.

Registration Laws

During the years when campaigns registration laws engrossed the societi it was expected that such laws, wh they were adopted by all the states, wou "put teeth" in the ethical codes. Statut penalties and state agencies for enfor ment, it was believed, would make co of ethics effective. Overlooking the eff of the "grandfather clause" which e vated many mechanics and surveyors the rank of engineer and ensured the rig of many incompetent and unethical en neers to continue practice, proponents the laws expected registration to scre undesirables and thus exclude potent violators of ethical codes. Soon after laws went into effect it was apparent t the boards charged with administer registration laws were given staffs adequate to enable them to police phases of the practice of engineeri Their resources were hardly adequ

for the job of searching out cases of misuse of the title "engineer," unauthorized practice, and evasion of provisions in regard to "responsible charge." They had little opportunity to initiate action against engineers who were dishonest or incompetent.

It was soon apparent that both individual members of the profession and engineering organizations were very reluctant to bring charges, initiate action, or even appear as witnesses against men who were accused of dishonesty or incompetency. The profession looks to the National Society of Professional Engineers through its constituent state societies for dynamic leadership in enforcement of registration laws. Perhaps, in the future, canons of ethics can be written into the registration laws and enforced.

Evolution of Principles

Despite the fact that the societies are relatively impotent in legalistic enforcement of ethical codes, they have in a very valid way "enforced" them. The real measure of progress in ethics is not the number of cases of unethical conduct detected and punished; the real measure is the evolution of clear principles of conduct accepted by a majority of engineers as right and just and worthy of support. Since 1922, the societies, by formulating principles of ethics and by provoking discussion of ethical codes made up of such principles, either in society meetings or society publications, have built up strong convictions which will govern the actions of all but a small, unscrupulous minority. They have organized sentiment within the profession against many practices accepted in 1922 by a majority of engineers as ethical, although they were admittedly harmful to the public and to the profession of its members. Some of these practices, one of which was competitive bidding, were justified as meeting a statutory requirement—an excuse which has been debunked by a series of court decisions.[3] Despite engineering's codes and the courts' interpretation of the statutes, competitive bidding will *be* unethical only when the principle laid down in the engineering code has made acceptance by the public and practically unanimous indorsement by members of the profession.

Changing Standards

Not all the ethical problems facing the profession today are those inherited from the generation which spoke in The Annals of 1922. Conservatives of that day were unable to see any distinction between "unionism" and "collective bargaining." The American Association of Engineers in 1918 represented the unorganized technical employees of the railroads before the United States Railroad Wage Commission.[4] The Association's spokesmen were officials of the very railroads involved. No coercion was used or threatened. The Association relied entirely upon the fairness of the Wage Commission and the public, and based its case upon the fact that despite increased living costs the salaries of technical employees had not been increased and that in comparison with the wages of organized labor the salaries of engineers were not commensurate with the services they rendered or the time and money spent in preparation for engineering careers. The American Association of Engineers contended that it was "professional" and highly ethical for a society composed of employer and employee engineers to work for the social and economic welfare of all members of the profession. It denounced, however, alignments in which employee engineers were pitted against employer engineers and "collective bargaining" which was based on coercion. Since the passage of the Wagner Act in 1935, a new generation of engineers has found the problem of "collective bargaining" fraught with ethical considerations. Because the Wagner Act gave the National Labor Relations Board arbitrary power to assign

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[3] The American Society of Civil Engineers has reprinted for wider distribution an excellent article which appeared originally in the May 1954 issue of *Civil Engineering*, captioned "Competitive Bidding for Professional Services Not in the Public Interest," in which the author digests a series of court decisions which deny the validity of the "statutory" argument.

[4] On March 31 to April 2, 1919, the Association also testified before the Board of Wages and Working Conditions (appointed May 25, 1918) of the United States Railroad Administration, the Engineering Council assisting in presentation of the case.

engineers, without their consent, to heterogeneous bargaining units represented by labor unions, the American Association of Engineers prepared a manual called *Technologists' Stake in the Wagner Act* to show engineers how to defend their *real* "freedom of association" under the act and to bring about amendment of the statute. Although the Taft-Hartley Act has ensured autonomy to professional employees, a new generation of engineers insists that collective bargaining is the order of the day and hence ethical, and proclaims its right to "organize" along union lines without sacrifice of professional status. The controversies arising from this situation are bitter, and the discord is ominously apparent in the very silence of all codes on the subject.

One concept which has altered with changing conditions is the attitude of the profession toward the practice of engineering by corporations. In 1922, many eminent engineers were fairly dogmatic on this issue. Today many of them are not so sure that the corporate form is per se "unethical," because of the mammoth responsibilities assumed by engineering firms and the staggering capitalization needed to staff the firm with specialists and acquire instruments, laboratories, libraries, and other appurtenances.

Old Problems in New Guise

Some of the new problems are really very old, but they are disguised by innovations in the form of tricks and devices to conceal evasions and violations of ethical principles. Many of these have to do with unethical methods of "getting jobs," which John R. Snell bluntly describes in an appeal for "A Fighting Code of Ethics" in the July 1954 issue of *Consulting Engineer*. He lists "kickbacks," "commissions," "finder fees," "payment for influence" to assist in obtaining (or in payment for) engineering work.

It is interesting to note [says Mr. Snell] that as a general rule these malpractices exist in locales where corrupt political administrations are tolerated. In fact, the misuse of the construction industry and its heavy publicly subsidized appropriations is one of the importan means of support of corrupt governmen

He notes that engineers are "in on way or another responsible for the an nual expenditures of about 35 billions, and adds, "This is a public trust we can not glibly brush aside as the responsibilit of others." Mr. Snell believes that archi tects and engineering societies "mu agree on a modern, agressive high leve code of ethics." To enforce the code h would have all co-operating firms set u a single standard system of bookkeepin and would have the books of each firm audited periodically to detect infringe ments of the code.

Major Ethical Issues

Engineering has made giant stride since 1922 and engineers have inherite social problems of staggering importan —responsibilities which their narro technical training has ill fitted them assume. The Red Queen in *Through the Looking-Glass* said, "Now here, you se it takes all the running you can do stay in the same place. If you want get somewhere else, you must run least twice as fast as that!" Engineer despite their long struggle to raise ethic standards, confronted with unsolved pro lems, old and new, find themselves in ju about the same place they were in 192 Only a race of supermen could sprint fast as they must to meet the obligation imposed upon them by the kaleidoscop changes brought about largely by the own handiwork. They are harassed b petty problems which obscure majo ethical issues—on one side by those whi deplore "raiding" (the practice of offe ing irresistible inducements to partic larly gifted engineers employed by a com petitor) and on the other by those wh decry "gentlemen's agreements" betwee firms (not to hire each other's em ployees). Perhaps it is fortunate that the find such problems complex and absor ing. Their preoccupation with such detai may keep them from facing ethical co siderations involved in their responsibili (along with physicists and chemists) f devilish instruments they have devise which may either save our nation fro destruction by an aggressor or blast civ ization to extinction.

Engineer's Vow of Service*

We dedicate ourselves to the service of nkind as members of the Engineering ofession.

We consecrate our professional knowl- e and skill to the advancement of hu- n welfare, safety and progress.

As we benefit by the technical knowl- e and public esteem won for the Pro- sion by the Engineers who labored in past, we shall ever strive to augment t heritage before passing it on to the gineers who are to follow.

We therefore affirm our guiding pur- e:

o to live and work as to justify the st and confidence reposed in the Engi- neering Profession.

To carry out professional engagements with generous measure of performance, and with fidelity toward those whom we undertake to serve.

To foster a spirit of courteous consid- eration and fraternal co-operation within the Profession.

To extend encouragement and a help- ing hand to younger Engineers and to those in need.

To place Service before profit, the honor and standing of the Profession be- fore personal advantage, and the Public Welfare above all other consideration.

Specific Principles of Good Professional Conduct†

he compilation consists of four parts ollows:

art I. Relations of the Engineer to Public.

art II. Relations of the Engineer to nts and Employers.

art III. Relations of the Engineer to loyees.

art IV. Relations of the Engineer to r Engineers.

Part I

Relations of the Engineer to the Public

The Engineer should regard his duty he public welfare as paramount to all r obligations.

He should not use his professional ding as a means of sponsoring or pro- ng commercial or other undertakings speculative character.

He should scrupulously avoid con- ion, by act or omission, with any ille- or questionable undertaking or par- ation in any enterprise inimical to the ic welfare.

4. He should not advertise in self-laudatory language or in any other manner derogatory to the dignity of his profession.

5. He should avoid any publicity giving the impression that technical service in technical matters can be dispensed with; or that technical proficiency along any line is easy of acquisition; or that exaggerated returns may be expected from any limited course of technical instruction.

6. He should avoid any questionable statements or any statements couched in language that would convey a false impression, in any of his reports, advertisements, or articles.

7. He should avoid contingent fees as tending to prejudice the quality of the service which he renders; when retained to report on a property or project he should be scrupulously careful to make no business arrangement for compensation or otherwise that might tend to bias his report.

8. The Engineer should strive to give a full measure of service for the best interests of his client and of the public, and should charge fair and adequate fees for such service. He should maintain the professional attitude in negotiations for his services; and he should avoid all practices which have a tendency to affect adversely the amount, quality or disinter-

*Written by Dr. D. B. Steinman; adopted by American Association of Engineers on June 1927.

†Specific Principles of Good Professional Con- was compiled by the Practice Committee of American Association of Engineers under chairmanship of E. E. Carpenter (1923), ed by Dr. D. B. Steinman (Chairman, 25), and adopted by the Board of Directors 24.

ested nature of professional services, such as charging inadequate fees, competing on a price basis where (as is almost invariably the case) the service to be rendered or the character of its proper performance cannot be precisely defined, spending large amounts of money in securing business, or consenting to furnish monetary guarantees of cost estimates.

9. The Engineer should use every care to make his estimates accurate and reliable, and in particular should guard against allowing self-interest to lead him into making an inadequate estimate.

10. He should refrain from using any improper or questionable methods of soliciting professional work.

11. He should participate in clean politics and should strive to be a force to assist in the cleansing of politics.

12. He should take an active interest in the public welfare in behalf of which he should ever stand ready to volunteer his special knowledge, skill and training for the use and benefit of mankind.

Part II

Relations of the Engineer to Clients and Employers

1. The Engineer should pursue his professional work in a spirit of strict fidelity and full loyalty to his clients and employers.

2. He should inform a client or employer of any business connections, interests or affiliations which might tend to influence his judgment or impair the disinterested quality of his services.

3. He should accept compensation for his services in connection with any work from one source only, except with the full knowledge and consent of all the interested parties.

4. He should hold as confidential such information relating to the business or technical affairs of a client or employer as the latter regards or may be presumed to regard as personal or proprietary.

5. He should not engage in any outside work without the full knowledge and consent of his employer.

6. When connected with any work, he should not accept commissions, outside employment, promise of employment or any other consideration from a contra engaged upon that work.

7. He should have no business deali or connections with any client of his ploye without the full knowledge approval of his employer.

8. He should entertain no offers employment or other considerations fr a third party, when such may in any influence his actions or decisions with spect to the relations which may exist tween such third party and the Engine employer or client.

9. He should not accept commission other considerations for specifying or ommending supplies, equipment or serv

10. He should not pay commission others for recommending his service prospective clients.

11. He should have no interest direc indirect in any materials, supplie equipment used in the construction of his client or in any firms rece contracts for his client's work wit informing his client in advance o nature of such interest and obtaining sanction.

12. He should not engage in the i pendent practice of engineering wit the knowledge and sanction of his ploye, and under no circumstances sh he compete with his employer on the b of lower fees.

Part III

Relations of the Engineer to Employees

1. The Engineer should treat his ployees or subordinates in a spirit of f ness, with due regard and considera for their personal welfare and pro sional advancement.

2. There should be a professional b between employer and employee w both are engineers, which will dictate impel reciprocal interest and mutual c sideration.

3. The Engineer should pay adequ salaries commensurate with the imp tance and responsibility involved in service.

4. He should encourage the professi pride of his employees or subordinate their work and should offer them ev means of protecting their reputations

quality of the work entrusted to them not interfering with the proper performance of the duties for which they are ponsible.

5. He should recognize the freedom of employees to change employment and uld in no way hinder employees or ordinates on bettering their condition.

6. He should not discharge an employee, nor withhold employment from n, nor discriminate against him in any y on account of his affiliations or activ- s in any professional, political, or re- ous organization.

7. He should respect his employee's ht to freedom of thought, speech, and side activity as long as the same does impair the efficiency and value of the loyee's service.

8. He should see that his employee is quately covered by insurance against of casualty arising from his work.

9. In advertising or offering employ- nt, he should refrain from any misrep- ntation as to the conditions and per- nency of such employment.

10. If in public employ, he should as- ne the responsibility of consistently tecting the interests of his subordi- es.

11. He should make every effort to pro- steady employment for his employees when forced to discharge an employee should give the most generous notice sible and exert every reasonable effort ssist the employee in finding another tion.

Part IV

The Engineer's Relations to Other Engineers

1. The Engineer should not by word, or omission, injure falsely or mali- sly, directly or indirectly, the profes- al reputation, prospects or business of ther Engineer.

2. He should not attempt to supplant ther Engineer after definite steps have n taken toward his employment.

3. If employed in conjunction with an- r Engineer, and by the same client, he uld not review and comment conclu- ly upon the work of the other Engi- except with his full knowledge and sent or unless the connection of such r Engineer to the work has been previously terminated.

4. He should not use unfair means to effect his professional advancement or to injure the chances of another Engineer to secure and hold employment.

5. He should not attempt to inject his services into a project at the expense of another Engineer who has been active in developing it.

6. He should not interpose between other Engineers and their clients when unsolicited. When solicited, he should avoid any possibility of doing a brother Engineer an injustice.

7. He should not seek or solicit a position occupied by another Engineer.

8. He should not attempt to secure work on the basis of lower salaries or fees.

9. He should be courteous, fair, considerate in his dealings with other Engineers.

10. He should conduct any necessary comment on or criticism of the work of other Engineers with careful regard for the good name and dignity of the engineering profession, and he should scrupulously refrain from criticism to personal advantage, as in negotiating for an engagement.

11. He should not commercialize his affiliations with, or official position in, any technical organization.

12. He should not use his professional affiliations to secure the confidence of other Engineers in speculative commercial enterprises.

13. As a member of any professional organization, he should avoid any act tending to promote his own interest at the expense of the dignity and standing of the organization.

14. As an officer of a professional organization, he should sedulously avoid any appearance of using his position for personal advertising.

15. He should cooperate in upbuilding the engineering profession by exchanging professional information and experience with his fellow engineers and students of engineering, and by contributing to the work of engineering societies, schools of applied science, and the technical press.

16. He should regard himself as a debtor to his profession and should dedicate himself to its advancement.

The Profession's First Code of Ethics*

Any code of ethics must be predicated upon the basic principles of truth and honesty. "Whatsoever things are true, whatsoever things are honest," are the things for which engineers must contend.

An engineer may not "go beyond and defraud his brother" by any underhand act or method. He may not do or say anything which will injure his brother's reputation or his business for the purpose of securing his own advancement or profit. This admonition carries with it no obligation to refrain from telling known and absolute truth about an unworthy brother, as a protection to others; but the truth so told must be such as can be substantiated, and he who tells it must have the courage which will not shrink from the consequence of his telling.

The engineer owes his client allegiance demanding his most conscientious service. But conscientious service to the client must never entail a surrender of personal convictions of truth and right.

An engineer who receives compensation from an employer may not receive gift, commission or remuneration of any kind from a third party with whom he d business for that employer.

An engineer seeking to build up business may not resort to self-laudat in advertising. He may state briefly lines of work in which he has had exp ence, and enumerate responsible positi which he has held and give his referen

An engineer who employs others, eit in his own service or in that of the cli who employs him, should recognize in relationship to them an obligation of emplary conduct, of helpfulness and sonal interest in those with whom h thus brought in contact, and he should charge such obligation tactfully kindly.

The honor of the profession should dear to every engineer, and he should member that his own character and duct reflect honor, or the reverse upo profession.

If, then, he so lives that his own h shall never be smirched by his own or omission, he will thus maintain honor of the organization to which belongs.

Canons of Ethics for Engineers†

Foreword

Honesty, justice, and courtesy form a moral philosophy which, associated with mutual interest among men, constitutes the foundation of ethics. The engineer should recognize such a standard, not in passive observance, but as a set of dynamic principles guiding his conduct and way of life. It is his duty to practice his profession according to these Canons of Ethics.

As the keystone of professional conduct is integrity, the engineer will discharge his duties with fidelity to the public, his employers, and clients, and with fairness and impartiality to all. It is his duty to interest himself in public welfare, and to be ready to apply special knowledge for the benefit of m kind. He should uphold the honor dignity of his profession and also a association with any enterprise of q tionable character. In his dealings fellow engineers he should be fair tolerant.

Professional Life

Sec. 1. The engineer will co-operat extending the effectiveness of the e neering profession by interchanging inf mation and experience with other e neers and students and by contributing the work of engineering societies, scho and the scientific and engineering pr

Sec. 2. He will not advertise his w or merit in a self-laudatory manner, he will avoid all conduct or practice lik to discredit or do injury to the dig and honor of his profession.

* Written by Isham Randolph; adopted in 1918 by the American Association of Engineers.
† Adopted by the Engineers' Council for Professional Development, October 25, 1947.

Relations with the Public

Sec. 3. The engineer will endeavor to extend public knowledge of engineering, and will discourage the spreading of untrue, unfair, and exaggerated statements regarding engineering.

Sec. 4. He will have due regard for the safety of life and health of the public and employees who may be affected by the work for which he is responsible.

Sec. 5. He will express an opinion only when it is founded on adequate knowledge and honest conviction while he is serving as a witness before a court, commission, or other tribunal.

Sec. 6. He will not issue ex parte statements, criticisms, or arguments on matters connected with public policy which are inspired or paid for by private interests, unless he indicates on whose behalf he is making the statement.

Sec. 7. He will refrain from expressing publicly an opinion on an engineering subject unless he is informed as to the facts relating thereto.

Relations with Clients and Employers

Sec. 8. The engineer will act in professional matters for each client or employer as a faithful agent or trustee.

Sec. 9. He will act with fairness and justice between his client or employer and the contractor when dealing with contracts.

Sec. 10. He will make his status clear to his client or employer before undertaking an engagement if he may be called upon to decide on the use of inventions, apparatus, or any other thing in which he may have a financial interest.

Sec. 11. He will guard against conditions that are dangerous or threatening to life, limb, or property on work for which he is responsible, or if he is not responsible, will promptly call such conditions to the attention of those who are responsible.

Sec. 12. He will present clearly the consequences to be expected from deviations proposed if his engineering judgment is overruled by nontechnical authority in cases where he is responsible for the technical adequacy of engineering work.

Sec. 13. He will engage, or advise his client or employer to engage, and he will co-operate with, other experts and specialists whenever the client's or employer's interests are best served by such service.

Sec. 14. He will disclose no information concerning the business affairs or technical processes of clients or employers without their consent.

Sec. 15. He will not accept compensation, financial or otherwise, from more than one interested party for the same service, or for services pertaining to the same work, without the consent of all interested parties.

Sec. 16. He will not accept commissions or allowances, directly or indirectly, from contractors or other parties dealing with his client or employer in connection with work for which he is responsible.

Sec. 17. He will not be financially interested in the bids as or of a contractor on competitive work for which he is employed as an engineer unless he has the consent of his client or employer.

Sec. 18. He will promptly disclose to his client or employer any interest in a business which may compete with or affect the business of his client or employer. He will not allow an interest in any business to affect his decision regarding engineering work for which he is employed, or which he may be called upon to perform.

Relations with Engineers

Sec. 19. The engineer will endeavor to protect the engineering profession collectively and individually from misrepresentation and misunderstanding.

Sec. 20. He will take care that credit for engineering work is given to those to whom credit is properly due.

Sec. 21. He will uphold the principle of appropriate and adequate compensation for those engaged in engineering work, including those in subordinate capacities, as being in the public interest and maintaining the standards of the profession.

Sec. 22. He will endeavor to provide opportunity for the professional development and advancement of engineers in his employ.

Sec. 23. He will not directly or indirectly injure the professional reputation, prospects, or practice of another engineer. However, if he considers that an engineer

is guilty of unethical, illegal, or unfair practice, he will present the information to the proper authority for action.

Sec. 24. He will exercise due restraint in criticizing another engineer's work in public, recognizing the fact that the engineering societies and the engineering press provide the proper forum for technical discussions and criticism.

Sec. 25. He will not try to supplant another engineer in a particular employment after becoming aware that definite steps have been taken toward the other's employment.

Sec. 26. He will not compete with another engineer on the basis of charges for work by underbidding, through reducing his normal fees after having been informed of the charges named by the other.

Sec. 27. He will not use the advantages of a salaried position to compete unfairly with another engineer.

Sec. 28. He will not become associated in responsibility for work with engineers who do not conform to ethical practices.

Long Beach

The September meeting of the Long Beach Chapter, A.A.E., was held at the University Club, 6:45 P.M. This was the chapter's first meeting of the year, Vic Case was elected president, R. M. Wright, Vice President, Bob Wetzel, Secretary and Don Thomas, Treasurer. Officers will be installed at the October meeting.

Mr. Claude Brosterhouse of Coleman Engineering Co., Los Angeles, spoke on "Project Smart", regarding the research, development and testing of equipment to aid in personnel escape from high speed aircraft.

The Hoover Medal Awarded

The Hoover Medal for 1956, one of the engineering profession's most distinguished honors, has been presented to Herbert Hoover, Jr., Under Secretary of State. Mr. Hoover's career has been largely in the field of petroleum geophysics.

The Hoover Medal was named after former President Hoover, father of the Under Secretary and, in 1930, its first recipient. It was awarded then, as it has been through the years since, "By engineers to a fellow engineer for distinguished public service." President Hoover is an Honorary member of the American Association of Engineers.

Engineering Secretaries to Meet

The annual meeting of the Council of Engineering Society Secretaries will be held at the New York Statler, New York City on Monday, Tuesday and Wednesday, January 14, 15 and 16, 1957.

Immediately following, the third General Assembly of Engineers Joint Council will be held on Thursday and Friday, January 17 and 18, also at the Statler. The General Assembly of the EJC provides a national forum for the discussion of problems which are of interest and importance to engineers as professional people.

A.A.E. Book Department

A "Sales and Service" department

We will cheerfully help you locate that "hard to find" book

Chaffey College

Word comes from Arthur Flum that the Student Chapter, of the American Association of Engineers at Chaffey College Ontario, California, is getting ready for a banner year. Their first meeting has been held and plans are being formulated by the young engineers to make their group an outstanding one on the college campus.

1956 Meeting of NCSBEE

Pecos H. Calahan, Executive Secretary of the Consulting Engineers Association of California, and a past director of the American Association of Engineers, represented A.A.E. at the annual meeting of the National Council of State Boards of Engineering Examiners, held on August 23, 24 and 25 in Los Angeles, California.

Bruce Williams of Joplin, Mo., served the Council as its president during the 1955-56 fiscal year, and at the August meeting Edward R. Stapley of Stillwater, Oklahoma, was elected president, and Allen S. Janssen, Moscow, Idaho, president-elect. The executive secretary is T. Keith Legare, whose address is P.O. Drawer 1404 Columbia, South Carolina.

Asa G. Proctor, of California, member of A.A.E., is Vice-Chairman on the Committee on Uniform Laws and Procedures, and W. M. Spann of Missouri, is Chairman.

The Forgotten Ninth Amendment

Engineers who are universally recognized as "individualists" should be much interested in a challenging new book by Bennett B. Patterson, Houston, Texas, attorney, entitled "The Forgotten Ninth Amendment." In the forward of his book, Mr. Patterson says:

> **Since individual freedom is the basis of democracy, and is the virtue which marks the excellence of our form of government over all other forms of government, then the Ninth Amendment immediately takes its place as the most important declaration in our Constitution, because such a declaration is nowhere else therein to be found.**
>
> **The Ninth Amendment announces and acknowledges in a single sentence that (1) the individual, and not the State, is the source and basis of our social compact and that sovereignty now resides and has always resided in the individual; (2) that our Government exists through the surrender by the individual of a portion of his naturally endowed and inherent rights; (3) that everyone of the people of the United States owns a residue of individual rights and liberties which have never been, and which are never to be surrendered to the State, but which are still to be recognized, protected and secured; and (4) that individual liberty and rights are inherent, and that such rights are not derived from the Constitution, but belong to the individual by natural endowment.**

As Mr. Patterson has pointed out, only in the Ninth Amendment to the Constitution is the great clarion call of the preamble to the Declaration of Independence echoed. It is, therefore strange, as Mr. Patterson says, that "Up to this date, no real purpose for the Ninth Amendment has been found. In our entire legal and legislative history it has never been used as

the basis for the announcement, protection, or vindication of any human right or inherent liberty."

This book traces the origin and history of the Ninth Amendment and makes available the debates over the Bill of Rights which clarify the intent of the authors of these amendments. This is fascinating history, of interest to all citizens, not merely students of law and political economy. It makes an appeal, in non-technical language, to all who are interested in preserving the most distinctive characteristic of democratic government. It also emphasizes what most dissertations on "rights" of any kind ignore—the concomitancy of rights and obligations. Most engineers will join Mr. Patterson in his final declaration:

> **The people who are happiest are those who live simply but have a high standard of thinking. You have done your part if you have tried your best to develop that personality which is yours and yours alone . . .**
>
> **. . . You are an important and worthwhile personality and you live under a government that has not forgotten you as an individual. May you always continue to fight for and believe in a government that believes in you.**
>
> **May all of us be humbly grateful to a Creator who has endowed us with a soul, and a constitutional government which guarantees us the right to own it.**

The Forgotten Ninth Amendment by Bennett B. Patterson. $4.00. Order through A. A. E. Book Dept.

Books for Engineers

Industrial Statistics, Handbook of: Albert H. Bowker, Director Applied Mathematics and Statistics Laboratory, Stanford and Gerald J. Lieberman, Project Director, U.S. Dept. of Defense, and member of the faculty, Stanford Univers. Prentise-Hall, Inc. $5.00

A reprint of the section on Industrial Statistics in the Handbook of Industrial Engineering and Management (1955) edited by W. G. Ireson and E. L. Grant, as a convenient tool for engineers, statisticians, and teachers of courses in the subject. This handbook aims to present statistics as a science for making decisions, rather than as an art. A detailed explanation of each technique is included with tables for its application. Examples and problems in research and production are included in the text.

Modern Manufacturing Processes: Joe L. Morris, Assoc. Prof., M.E., Georgia Inst. of Technology. Prentise-Hall. $9.35

This book covers processing of all commercial metals, plus the working of plastics. Each process or method is described and evaluated. Throughout the book the author highlights recent developments which have the greatest practical value to workers in this special field. A valuable book to the industrialist, engineer and student.

Aircraft Gas Turbines: C. W. Smith, Aircraft Gas Turbine Div., General Electric Co. John Wiley & Sons. $8.75

In his new book, the author has furnished a rather complete picture of the aircraft gas turbine power plant. He concentrates on fundamental principles

which are important regardless of changes in design details and in that way covers a wide range of material in a concise manner. This is the first book to adopt throughout the practice of expressing equations in terms of the isentropic factor X. Symbols are in accordance with the recommendations of the A.S.A.

Analysis of Structures, The, by N. J. Hoff, Head, Dept., Aeronautical Engineering and Applied Mechanics, Polytechnic Inst. of Brooklyn. John Wiley and Sons. $9.50.

Dr. Hoff's book is based on the Minimal principles and the principle of Virtual Displacements. His philosophy is that all methods used by structural engineers are clearly interconnected when viewed in the proper light. This idea is set forth as the author presents structural analysis as a logical, unified theory based on a few first assumptions.

Practical Solution of Torsional Vibration Problems, Vol. 1, Frequency Calculations by W. Ker Wilson, D.Sc. Ph.D., M. Sc. 3rd ed. rev. John Wiley & Sons. $16.00.

Text of this book has been completely re-written to bring the subject matter up to date; however, the original purpose in providing an adequately comprehensive treatment in a form suitable for everyday reference has been retained. Carefully prepared, authentic book.

Analysis of Electric Circuits, William H. Middendorf, Assist. Prof., E.E., Univ. of Cincinnati, John Wiley & Sons. $6.00.

In his book, the author treats only those topics most essential to a basic understanding of his subject. These basic concepts are presented in detail and are accompanied by a variety of numerical examples and problems. Dr. Middendorf presents an interesting story of circuit analysis rather than dry facts.

Architectural Construction, Theodore Crane, Prof. Emeritus, Arch. Eng., Yale. 2nd ed. John Wiley $10.00.

The first edition of Prof. Crane's book was published in 1947 and since that time economic conditions in the building industry have caused many changes. The new second edition gives a complete view of the more useful types of construction and the newer features of building design available in the U.S. For students and practicing architects and architectural engineers.

Foundations, Design and Practice, Elwyn E. Seelye, John Wiley & Sons, $16.00.

This excellent book by an outstanding author gives a complete treatment of foundations—covering design, construction methods, costs, specifications and field practice. Any Seelye book is worth much more than its retail price.

Linear Transient Analysis, Vol. 22, Ernst Weber, Prof., E.E., Polytechnic Inst. of Brooklyn. John Wiley & Sons. $10.50.

As does Vol. 1, this book presupposes a knowledge of the functions of a complex variable and familiarity with simple lumped circuits. The book includes a comprehensive treatment of the two-terminal-pair network. An authentic treatment by an capable author.

Television Engineering, Principles and Practice. Vol. 2, Video-Frequency Amplification, S. W. Amos, and D. C. Birkinshaw. $15.00.

This volume describes the fundamental principles of video-frequency amplifiers and examines the factors which limit their performance at the extremes of the passband. A wide variety of circuits is described. A special section deals with problems of camera-head amplifiers.

Generation of Electricity by Wind Power, E. W. Golding, MSc.Tech., M.I.E.E. Philosophical Library. $12.00.

The author gives an account of the research and development work which has been done in Great Britain and other countries in an effort to make use

of wind power on a significant scale. It outlines the technical and economic questions which arise and describes steps being taken to provide answers.

Principles of Chemical Engineering Thermodynamics, Ernest D. Wilson, Prof., Chem. Eng. and Chemistry, Worcester Polytechnic Inst. and Harold C. Ries, Shell Dev. Company. McGraw-Hill Series. $7.50.

The authors have presented thermodynamics as a tool and a method of approach to the solution of industrial problems, and throughout the text simplicity is stressed without sacrificing accuracy or omittng important subjects. Problems have been included in the text and much of the data required for solution is given in the Appendix.

Surveying Instruments and Methods for Surveys of Limited Extent, 2nd ed. Philip Kissam, Prof., C.E. Princeton. McGraw-Hill Book Co. $5.75.

Because the book embodies the author's wide practical experience, it views surveying from the point of view of the working surveyor, and thus can easily be used by the young surveyor for self-study. The book completes the surveying instruction necessary for mechanical, electrical, chemical and similar types of engineers and provides an excellent course for any one interested in the study.

Key Check Points in TV Receivers—A Howard W. Sams Photofact Publication. First Edition. $2.00.

The purpose of this manual is to present to the service technician, the voltages and waveforms which are present at Key Check Points in a TV receiver. A useful little book, as are all the Sams publications.

Color TV Training Manual, C. P. Oliphant and Verne M. Ray, a Howard W. Sams Photofact Publication. $6.95.

The book deals with the fundamentals of color receiver circuits, and a description of circuits found in commercially available receivers is presented. Chapters on setting up the color receiver and servicing contain data that will help the reader tackle that first service job.

TV Servicing Guide, Leslie D. Deane and C. C. Young, Jr. a Howard W. Sams Photofact Publication. $2.00.

Various troubles encountered in television receivers are discussed. A well arranged, illustrated service manual, with alphabetical index.

ABACS or Nomograms, A. Giet. Ecola Nationale des Ingenieurs Arts et Metiers, Paris, translated and revised by J. W. Head, M.A., Math. Cons. Research Dept., B.B.C., and H. D Phippen, M.A. (Edin.), B.Sc. (London).

An introduction to their theory and construction illustrated by Examples from Engineering and Physics. An excellent and valuable publication.

Atoms and Energy, Prof. H. S. W. Massey. Philosophical Library. $4.75.

An up to date treatise on the subject, including a discussion of the hydrogen bomb. Sections on applications of atomic energy refer to the situation prevailing as of June, 1952.

Geology and Ourselves, F. H. Edmunds, Philosophical Libr. $10.00.

The book shows the importance of geology in our everyday life. Text has been prepared by Mr. Edmunds, who was for more than 30 years a member of the staff of the Geological Survey of Great Britain, thus giving him a wide and varied experience on this important subject.

Microscopic Petrography, E. Wm. Heinrich, Dept., Mineralogy, Univ. of Mich. McGraw-Hill Book Co. $6.50.

Here is a book that provides practicing geologists and students with a complete treatment of the microscopic in-

vestigation of igneous, sedimentary and metamorphic rocks. All up to date material in the field has been included. Discussion of the point counter in micrometric mineralogical analysis is most valuable.

Conversion Factors and Tables, 2nd ed. Zimmerman and Lavine, both professors of chemical engineering, University of New Hampshire, $5.00. Ind. Research Service, Inc.

The new second edition of this handy 4½x6 inch, 502-page book contains considerable new material as well as all the important text of the first edition, published ten years ago. Valuable information on conversion factors for most of the foreign countries of the world has been added; also a section on foreign monetary equivalents and a table of physical constants.

Design for Decision, Irwin D. J. Bross, The MacMillan Company. $4.25

The process of selecting one action from a number of alternative courses of action is what the author means by decision and in his book he discusses how to make decisions, and describes briefly what is meant by statistical decision. An interesting and helpful book.

Soil and Water Conservation Engineering, Richard K. Frevert, Assist. Dir., Prof., Agricultural Engrg., Iowa State College, Glenn O. Schwab, and Kenneth K. Barnes, both professors of Agricultural Engrg., Iowa State, and Talcott W. Edminster, Agricultural Engineer, Soil and Water Conservation, Research Branch, ARS, Beltsville, Md. John Wiley & Sons. $8.00

A most valuable book for the soil and conservation engineer by capable authors. All phases of soil and water conservation engineering are covered in this volume thus eliminating the need for multiple reference and time-consuming research. The book shows the importance of sound and precise engineering design as the foundation for successful and lasting results in conservation work.

The American Architects Directory

Here's a book filled with biographical data on some 11,000 active American architects, that should have a ready sale.

Information on all members of the American Institute of Architects and on certain non-members is included in this 748-page directory. In each of the alphabetically arranged biographies, when the information was obtainable, there are complete details on the architect's home and business address, his outstanding architectural achievements, positions he has held, education, professional affiliations, etc. There is also a geographical cross-index.

There is an excellent appendix which includes a series of articles on such topics as the "Value of the Architect," "The Selection of the Architect," etc. Names and addresses of secretaries of the Boards of Examiners of Architects throughout the country and its territories as well as those of the secretary of the National Council of Architectural Registration Boards, are listed.

Qubic, the 3-D Space Game:

Here's an interesting game which is fun for everyone. A three-dimensional Tic Tac Toe for the young player and the intellectual, for 2, 3 or 4 players. Qubic is played on four levels of 16 squares each and the object is to place four markers of the same color in a straight line, horizontally or vertically.

Interesting Pamphlets

Highway Research Board, Bibliography No. 11. Origin-Destination Surveys and Traffic Volume Studies, 1951. $3.

Highway Research Board. Bulletin No. 43. Studies in Night Visibility. 90 cts. National Research Council, Wash., D.C. Bulletin No. 44, Volcanic Ash and Laterite Soils in Highway Construction, 1951. 60 cts. Bibliography No. 12, Joint, Crack and Undersealing Materials. Bulletin 49, Analysis of Landslides, publication 220,

Industrial Furnaces: Vol. 2, 3rd Ed., W. Trinks, Prof. Emeritus, M.E., Carnegie Inst. of Technology, John Wiley & Sons. $10.00

Industrial Furnaces describes and discusses practically everything that is needed for efficient furnace operation. The new third edition of this well-known and successful book has been brought completely up-to-date, covering the many advances in the field since 1941. Well illustrated. Vol. 1, 4th ed. 1951, $12.75, incorporates scientific facts which research has discovered about heat transfer and furnace design as well as current design and operating principles and techniques.

Horner's Dictionary of Mechanical Engineering Terms, 7th ed. revised: Staton Abbey, Workshop Practice Encyclopaedia. Philosophical Library, Inc. $6.50

The book is in two parts. Part 1, Modern Terms and Part 2, General and Traditional Terms. The book was originally compiled by J. C. Horner, A.I.M.E., and is more than a dictionary, rather a condensed encyclopaedia of mechanical engineering practice. Since the work of a mechanical engineer overlaps that of other branches, the 7th ed. contains information in allied fields.

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200 Miles Up: J. Gordon Vaeth, Head, New Weapons and Systems Div., U.S. Navy Special Devices Center Office of Naval Research. 2nd ed. Ronald Press. $5.00

The conquest of the upper air, a story of the highest flights yet achieved or about to be achieved, by man-made objects; A progress report on man's coming mastery of space. The book is packed with exciting information about the progress of the American program of Upper Air research since its inception in 1946.

Technical Publications: Their Purpose, Preparation and Production: C. Baker, A.R. Ae.S. John Wiley & Sons. $6.00

Proper preparation of technical papers is the aim of this book especially in the engineering field. It is compiled on broad lines and deals with a study of the user, the gathering of information and the writing of text, preparation of illustrations and the reproduction of the work. It is not a textbook, simply a guide that should be helpful to writers of technical papers.

Automatic Process Control for Chemical Engineers: Norman H. Ceaglske Prof., Chemical Engineering, University of Minn. John Wiley & Sons $6.75

This is the first book to present and apply the basic mathematical principles of process control in an elementary form. It is written for the chemical engineer. In addition to a review of principles and their application to simple control systems, Prof. Ceaglske also includes methods for calculating the dynamic response of processes.

Design of Prestressed Concrete Structures: T. Y. Lin, Prof., C.E., University of Calif. John Wiley & Sons $11.50

The text begins with the material and procedures of prestressing, and continues on through loss of prestress, design for flexure, shear, bond, composite sections, continuous spans, prestressed columns, and tanks. The book concludes with a compact discussion of economics, fire and corosion resistance, impact and fatigue strength. A most comprehensive treatment covering all phases of prestressed concrete structures, by an able author. Only elementary knowledge of strength of materials and reinforced concrete is required to understand this excellent presentation. Well worth its cost.

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odynamics, a Study in Logic, Fact, Similitude: Garrett Birkhoff, ver Publications, Inc. $1.75 paper nd. $3.50 cloth.

s book is devoted to two special ts of fluid mechanics; the com- ed logical relation between theory experiment, and applications of etry concepts. Most of the ma- was originally presented in lecture at the University of Cincinnati in 1947. A valuable bibliography etes the text.

Mathematical Analysis of Electrical Optical Wave-Motion: H. Bate- , M.A., Ph.D., late Fellow, Trinity ege, Cambridge, Dover Publica- s. $1.60 paper bound.

tten by a distinguished mathe- l physicist, this book is a prac- ntroduction to those developments axwell's electromagnetic theory are directly connected with the n of the partial differential equa- f wave-motion. Although a good dge of math is necessary for a thorough understanding of the subject, there are many sections of the book which the reader with only a limited math equipment can grasp readily.

Partial Differential Equations of Mathematical Physics, by A. G. Webster, edited by Samuel J. Plimpton, Ph.D., Yale. 2nd corrected ed. Dover Publications. $1.98 paper

This comprehensive work by one of the country's great mathematical physicists, is still one of the important treatises on partial differential equations in any language, covering the basic method, theory and application.

Cement and Concrete, the Technology of: Robert F. Blanks, V.P., Great Western Aggregates, Inc., and Henry L. Kennedy, Mgr., Construction Sp. Div., Dewey and Almy Chem. Co., Div., W. R. Grace & Co. Vol. 1, Concrete Materials. John Wiley & Sons. $11.00

This is the first part of a projected two-volume work written to serve everyone interested in concrete materials. The book's main emphasis is on portland cement and aggregates, the most important ingredients of concrete. Much information is found between the 422 pages of this work not readily available in other books on the subject. An interesting as well as valuable contribution to the industry. Volume 2 will deal with the most effective combinations of the various materials and with the properties and uses of the resulting concretes.

Bearing Lubrication Analysis: R. R. Slaymaker, Prof., Machine Design. Case Institute of Technology. John Wiley & Sons. $5.00

A 108-page book written for the machine designer rather than the lubrication specialist, covering the general principles of lubrication analysis in bearing design. Sleeve bearings, the most common type of bearing found in machines, is stressed, illustrated with case studies and examples. Also stressed throughout the book is oil viscosity.

Electronic Engineering: Samuel Seely, Prof. and Chairman Dept. Electrical Engrg., Syracuse University.

Although this book, together with its companion volume Radio Electronics, is a revision and enlargement of Prof. Seely's Electron Tube Circuits, both books are written as independent, self-contained texts. It is a detailed discussion of a large variety of electronic circuits which are important in such diverse fields as radar, television, electronic control and instrumentation, and computers. Emphasis is placed on the physical and mathematical analysis. Examples and problems are used to relate the theoretical developments with practical situations. An excellently prepared treatise, illustrated and adequately indexed.

Semiconducting and Luminiscent Materials and Their Applications, abstracts of the literature on: 1954, compiled by Batelle Memorial Institute, sponsored by the Electrochemical Society, Inc. John Wiley & Sons. $5.00

Principal source of reference is the various abstract journals; however, where possible, oral papers and other articles have been abstracted. Both foreign and domestic publication abstracts are included. Some excellent papers have been abstracted in this interesting volume.

The Washo Road Test, Part 2: Test Data, Analyses, Findings. Highway Research Board special Report 22, National Academy of Sciences, National Research Council. $3.60

The Washo test was conceived and sponsored by the Western Association of State Highway Officials. It was a study of the behavior of certain flexible pavements under the repeated application of a number of selected heavy axle loads. The report includes summaries and analyses of the data taken in the test, discussions and tabulation of the findings. The report was written by Project Engineer, W. N. Carey, Jr., of the Highway Research Board, and the Research Engineer, A. C. Benkelman the Bureau of Public Roads.

Mass-Transfer Operations: Robert Treybal, Prof., Chemical Engineer New York University. McGraw-Book Co. $9.50

In his book, the author introduces reader to the general features of di sion and the techniques used in industrial applications of the m transfer operations. He not only sents a sound background in the th retical material, but also covers principles of equipment design, eq ment operation, and the fields of appl tion for the following unit operati humidification and dehumidification, absorption, distillation, liquid ext tion, adsorption of gases and liquids exchange, drying, atmolysis or diffusion thermal diffusion, etc. A planned book for the Chemical Eng

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Practical Training Manual: TV se Vol. 1, Basic Television Ed-21, H ard W. Sams & Co. $3.00

A simple, well-planned manual those interested in television. Fu mental training is essential. Prep from sets of lecture, shop and classr material and embodies the latest t niques of the electronics industry. illustrated, 304 pages.

Business Law of Real Estate, Gerald O. Dykstra, LL.B., M.B Prof., business law, Univer. of M igan, and Lillian G. Dykstra, LL formerly instructor, Business Ohio Univ. The Macmillan Comp $10.00

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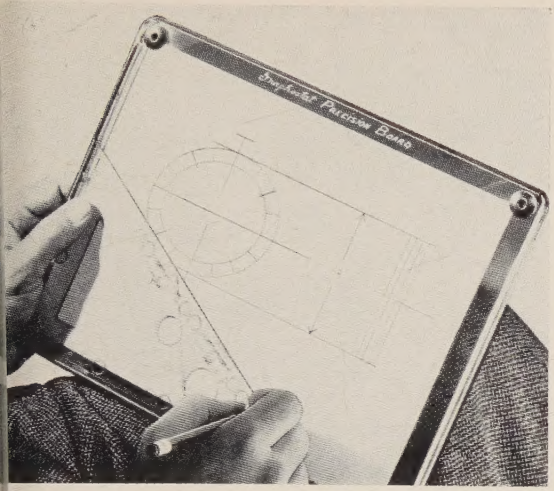

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